

Semilunar valve growth in fetal transposition of the great arteries: Semilunar valve size is predictive of postoperative aortic root dilatation.

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Introduction:

Transposition of the great arteries (TGA) is treated with the arterial switch operation (ASO). Despite excellent long-term survival, important residual lesions can be identified from early childhood, which may require re-interventions, such as neo-aortic root (NAoR)-dilatation.

The aim was to document semilunar valve growth in fetal-TGA and to determine if NAoR-dilatation can be predicted prenatally.

Methods:

All fetuses diagnosed with TGA suitable for ASO in four academic institutions, where stored data was available, were included (2000-2017). Measurements included diameters of semilunar valve annuli prenatally and postnatally; and NAoR at 1 year and last check-up.

Annulus growth was analysed using a linear mixed-effect model and compared to normal values (Schneider et al. 2005). Semilunar valve and NAoR Z-scores were correlated.

Results:

138 fetuses were included of which 88 (63,7%) were male. 51 (37%) had a significant ventricular septal defect (VSD) requiring surgical closure (12 with Taussig-Bing anatomy). 17 (12%) died (1 intrauterine death, 5 terminations of pregnancy, 5 preASO due to comorbidity and 6 (4,3%) postASO. 123 underwent an ASO (3 are still in utero).

382 fetal echocardiograms were performed. A postnatal echocardiogram was available in 118 giving preASO data from 500 echocardiograms. The median number of repeated measurements was 5 (1-10) per patient. The median postnatal follow-up was 2.9 years (4 months-13.3yrs) (n=119).

TGA-aortic valve (AoV) annuli were significantly larger than controls (A in Figure), but matched the control pulmonary valves (PV).

TGA-PV diameters were comparable with control PV annuli but were significantly larger than control AoV annuli, especially in the sub-group with a VSD (B and C in Figure).

Semilunar valve Z-scores correlated significantly with NAoR-dilatation, ($p < 0.001$ PV 26-36 weeks'; $p = 0.004$ AoV 26-30 weeks'). The best cut-off value to predict a postASO NAoR $\geq Z+2$ at last followup was a PV Z-score ≥ 0.08 at 26-30 weeks' (sensitivity 70%; specificity 80%).

Conclusion:

Fetal-TGA semilunar valve annuli show accelerated growth, especially when there is a significant VSD.

Significant correlations between fetal-TGA semilunar Z-scores and postASO NAoR-dilatation were found.

Factors besides postoperative hemodynamics such as prenatal flow, quality and quantity of connective tissue and genetic factors may influence semilunar valve growth and NAoR-dilatation.

Figure:

